HUMAN OCCUPATIONAL ILLNESSES AND INJURIES DUE TO EXPOSURE TO METHOMYL AS REPORTED BY PHYSICIANS IN CALIFORNIA IN 1980

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SUMMARY

During 1980, California physicians reported 25 cases of occupational exposure to methomyl. Twenty-one of the 25 cases were reported as systemic illnesses, 3 as eye injuries, and 1 as a skin injury. Thirteen persons reportedly were applying methomyl when exposure occurred. Also, 8 persons reported exposure while they mixed and loaded for aerial application of methomyl. Methomyl is available under two trade names, Lannate and Nudrin. Lannate was reportedly used by 22 persons. Nudrin was reportedly used by 2 persons. The product name and formulation was unspecified for the last incident. The most common route of exposure was inhalation of the fumes or drift while applying. Sixty percent of the workers either did not wear all of the required safety equipment or did not report if safety equipment was worn. Although the reported use of methomyl had increased 35 percent in 1980 in comparison with 1979, the total number of reported occupational illnesses remained the same. Total days of disability has decreased from 88 days in 1979 to 39 days in 1980. Hospitalization has increased slightly from 11 days in 1979 to 15 days in 1980.

INTRODUCTION

Twenty-five occupational exposures to methomyl were reported in 1980 either by physicians on a Doctor's First Report of Work Injury, by the State Health Department or by local health departments and were subsequently investigated by the local county agricultural commissioner's staff. These incidents were evaluated and summarized in the following case studies.

CASE STUDIES

Systemic Illnesses - 22 cases.

While spraying tomatoes with Lannate SP, the hose from the spray rig burst and drenched the applicator. An ambulance was called but it was delayed, so the employee was taken to a fire station, where he was transported to a hospital. Upon arrival at the fire station, the applicator was experiencing signs of frothing at the mouth, rigidity and shakiness. He was admitted into the hospital and remained 2 days. He reportedly was provided and wore safety equipment. He lost 2 days from work.

An applicator was working for about 2 hours applying Lannate SP and Cygon (dimethoate) on tomatoes when he became ill. He complained of cramps, vomiting and a headache. He was taken to the hospital where he was examined and given medication. He reportedly was wearing boots, coveralls, a face shield, gloves, a hat and a respirator at the time of his exposure. He lost 2 days of work. Upon his return to work, his duties were changed to minimize pesticide contact. He has had no recurring problem.

A worker was mixing, loading and applying Lannate SP on oranges. He reported inhalation of the pesticide vapors while applying. The worker stated that he takes his respirator off intermittently because it is uncomfortable to wear during an entire day; however, he claims he used all required safety gear that day. He developed a pain in his chest, excessive perspiration and vomited. He went to see a physician where he was treated with atropine and released. He missed 1 day from work and has not had any residual signs or symptoms from his exposure.

After mixing, loading, and applying Lannate SP and Dipel (Bacillus thuringiensis) on grapes for 2 consecutive days (20 work hours), a worker began to feel nauseated and developed a headache. He informed his foreman, who told him to seek medical attention. The physician administered atropine and told him to return the next day. He reportedly was wearing a respirator, a hat, a face shield, gloves and coveralls while he worked. He returned to work the next day.

An applicator was spraying both Lannate SP and Lannate L when the wind blew spray drift back onto him. He did not wash or change clothes after work. Later that day, he developed signs and symptoms of nausea with vomiting, extreme weakness and profuse perspiration. He was taken to the hospital for examination. No treatment was given. He did not miss any days from work.

A worker was applying Lannate SP on tomatoes. He developed nausea, vomiting and cardiac arrhythmias. Details of his incident were unspecified. He was admitted into the hospital overnight for observation. He was released the following morning. His estimated period of disability was expected to be 1 day.

An employee was spraying an eggplant field with Lannate and Dipel and began feeling ill. He complained of vomiting, diarrhea and slightly blurred vision. It was not reported if safety equipment was provided or worn. He was transported to the hospital by ambulance. The outcome of his illness is undetermined.

A self-employed applicator was working with Nudrin 90 in the morning and later felt nauseated. Details of his exposure were not reported. He sought medical attention; however, the outcome of his illness is undetermined.

An applicator was applying Lannate SP, Pydrin (fenvalerate) and Guthion (azinphos-methyl) by air. During the evening application, he began to experience blurred vision and eye irritation. He was aware of the signs and symptoms of possible pesticide poisoning so he decided to terminate his application and landed his plane. He was driven to the hospital for emergency treatment. The applicator stated that a high pressure line had broken between the spray boom and coupling hose. He believed that the pesticides may have entered the fuselage and then into the cockpit. A cholinesterase test was taken and his level was mildly depressed. He did not miss any days from work. No residual signs or symptoms were reported.

An employee was mixing and loading Lannate SP and Tiovel (endosulfan) for aerial application on lettuce. He wore coveralls, rubber boots, gloves, goggles, and a respirator. He hand-poured the Lannate and Tiovel. To his knowledge, he did not spill any material. When he got home, he developed cramps, diarrhea, dizziness and vomiting. He was taken to the hospital by a friend. He was admitted into the hospital and given atropine treatment. He remained in the hospital 3 days. His estimated period of disability was 1 week.

A mixer/loader was adding Lannate SP to the mix tank and some material splashed onto his face. He is a partner with his father in operating a crop dusting business, and often mixes and loads pesticides without using a closed mixing and loading system or other safety equipment, as required to be provided for employees. He stated that he was wearing a face shield at the time of the incident. When he arrived home, he complained of stomach cramps, skin irritation, and vomiting. He was taken to the hospital and admitted. He remained in the hospital 3 days where he received atropine treatment. He lost 3 days from work.

A mixer/loader was rinsing the mix tank and clearing the loading hose of residual Lannate liquid. He laid the hose on top of the mix tank and started the motor. The hose slipped off the tank and drenched the worker with dilute Lannate. He rinsed himself off with a fire hose, but did not change his clothes, even though extra clothing was available. He did not shower when he got home, and that evening he began to feel nauseated and

vomited. He also suffered from shortness of breath, dry throat, and dizziness. He was transported to the hospital for medical attention. He required 1 day of hospitalization. Treatment was not specified. It was later determined that the worker had also worked with Azodrin (monocrotophos) earlier the same day. He was off work 1 day and upon his return he was advised to avoid work with organophosphate pesticides for 2 weeks.

A worker was mixing and loading Lannate SP into a mix tank for aerial application. As he emptied 10-pound packages into the tank, he noticed some broken packages. He was working upwind of the tank but was not wearing a respirator. He apparently inhaled some powder and developed signs and symptoms of nausea, double vision and nervousness. He was taken to the hospital immediately and admitted overnight for observation. His estimated period of disability was expected to be 14 days.

While mixing and loading Lannate SP for aerial application on grapes, a worker became ill. He began to feel dizzy, had blurred vision, and a stomachache. He reportedly wore coveralls, a face shield, gloves and a respirator. He was transported to the hospital where he was treated with atropine sulfate. He remained 1 day. It was later determined that some bags of Lannate were found broken upon arrival. This may have resulted in exposure to the dust particles while mixing and loading. He returned to work following his discharge.

A mixer/loader for an aerial applicator was working with Lannate SP, Sevimol (product containing carbaryl) and sulfur. After working approximately 5 hours, he began experiencing some dizziness. His employer immediately took him to the physician's office for examination. The physician stated that the findings of the examination did not indicate a need for a cholinesterase test. He was advised and released. He was provided with and was wearing the required safety equipment. He did not miss any days from work.

An applicator was spraying Lannate SP on roses inside a greenhouse. After 3 hours of applying, he complained of nausea, vomiting, dizziness, weakness, increased bowel movements, and general discomfort. He sought medical attention that evening. The physician administered atropine and advised him to rest at home for 1 day. He reportedly wore all the required safety equipment. No workdays were lost.

An applicator was spraying Lannate SP on carnations. He worked with Lannate for about 1-1/2 hours after which he began to feel dizzy, nauseated and weak. He felt he had inhaled Lannate during application. He was provided safety gear but did not wear any because he felt it was too hot to wear. The conditions that day were reportedly windy. The worker reported his signs and symptoms to his employer's wife and she took him to the hospital. No hospitalization was required. The outcome of his illness was unspecified.

A tractor driver was working in a prune orchard that had been sprayed with Lannate SP that morning. He developed shortness of breath. He was taken to the hospital and his illness was diagnosed as carbamate poisoning. The employer stated that he warned the employee to stay out of the orchard for 24 hours; however, the employee did not understand. The attending

physician requested a cholinesterase test to be performed. Cholinesterase results were found to be within the normal range. The physician administered atropine as a precaution. He did not lose any days from work.

A worker was underneath a nurse rig repairing the generator when his hands and arms became contaminated with Lannate SP. He was taken to the hospital emergency room. The attending physician's diagnosis was pesticide poisoning. The worker was admitted into the hospital for 1 day where he received atropine sulfate treatment. He lost 1 day from work.

A dock worker was unloading cartons of methomyl when he inhaled some material. He developed mild signs and symptoms of carbamate poisoning. He sought medical attention at a nearby hospital. The outcome of his illness was unspecified; however, no disability was anticipated.

A worker was walking behind a spray rig applying Lannate SP to verify that the rig was spraying properly and that all jets were working. It was a hot day, so the worker was not wearing his respirator. Soon after, he developed signs and symptoms of nausea, shortness of breath and vomiting. He was transported to the hospital and admitted. The physician's diagnosis was methomyl poisoning. Treatment was not reported. He required 1 day of hospitalization and lost 1 day of work.

Eye Injuries - 3 cases

An applicator was spraying Lannate SP on grapes when his eyes became irritated. The irritation persisted for a week, so the worker consulted a physician. The physician advised him to stay off work for 4 days. He was re-examined at a later date and his injury had improved.

While an applicator was spraying Nudrin on grapes, some spray contacted his eyes. His eyes began to tear and itch. He went to see a physician whose diagnosis was chemical burn of the cornea. He was given Maxitrol drops for his eyes. Circumstances of his incident were not reported.

As a mixer/loader was removing the loading hose from the aircraft, the uncoupler malfunctioned and sprayed Lannate SP in his face and on his arms and hands. He immediately jumped into a nearby canal to flush his eyes and wash his arms and hands. His supervisor took him to the hospital. He developed constricted pupils and a burning sensation in his eyes. The physician's diagnosis was conjunctiva ulceration and mild carbamate poisoning. He was given atropine and ophthalmic ointment. He was admitted into the hospital for 1 day. Following his discharge he did not experience any further complications. He missed 1 day of work.

Skin Injury - 1 case

A mixer/loader was preparing Lannate SP and Carzol (another carbamate) for aerial application on citrus. Two days later he consulted a physician. He was complaining of generalized burning of his skin particularly on the neck and in the axillary area. No disability was incurred.

DISCUSSION

According to the Department's Annual Pesticide Use Reports the use of methomyl increased approximately 35% in 1980 in comparison with 1979; 1,669,222 pounds were reportedly applied in 1980 and 1,223,496 pounds in 1979. Total days of work lost reported in 1980 was 39 days which represents a 55 percent decrease over 1979 (88 days). Total days of hospitalization in 1980 increased 4 days over 1979, from 11 to 15 days; however, the average length of hospital stay per person declined. More specifically in 1980, 10 persons were hospitalized for 15 days for an average of 1.5 days per person. In 1979, 4 persons were hospitalized for 11 days for an average of 2.75 days per person. Methomyl is an N-methyl carbamate in toxicity category one. These carbamates inhibit cholinesterase. The inhibition of this enzyme results in the accumulation of acetylcholine in nerve tissue and effector organs with subsequent muscarinic and nicotinic signs and symptoms. The effect of N-methyl carbamates is somewhat similar to that of organophosphates, except that generally, carbamates are fast-acting and reversible in action, at less than fatal dosages. Exposure of mammals to methomyl can produce profound depression of serum cholinesterase, but this is usually reversed within 4 hours. Absorption through the intact skin appears to be of less importance; however, inhalation of spray fumes and mist is a concern. During 1980, the most common route of exposure was inhalation of fumes or spray mist while applying or mixing and loading. Thirteen persons reportedly were exposed while applying methomyl. Ten of the 13 persons were applying by ground, 1 was applying by air and 2 were applying inside a greenhouse. Eight persons reported exposure while they mixed and loaded methomyl for aerial applications. Methomyl is available under 2 trade names, Lannate and Nudrin. Lannate was reportedly used by 22 persons. Twenty of the 22 reported use of the soluble powder formulation, which is packaged in soluble bags. One person reported use of the liquid formulation and the remaining 1 person used an undetermined formulation. Nudrin was reportedly used by 2 persons. The soluble powder formulation, Nudrin 90, was involved in 1 case and an undetermined formulation was involved in the other. The product name and formulation was unspecified in one incident.

Tables 1-5 include values for the last 5 years to demonstrate possible trends between the years 1976-1980 for the following parameters; amount used and illness type, work activity and illness type, disability incurred, month of occurrence and county of occurrence. Table 6 portrays the work activity and the product name and formulation used in the 1980 cases. The work activities of greatest risk continues to be mixing/loading and applying. Exposure to drift or residue appears to be of little health hazard. Although hospitalization has increased, disability has shown a gradual decline over the past 5 years. The incidence of methomyl-related illnesses has generally occurred during the months of May to October. According to the Department's Annual Pesticide Use Report, 70 percent of the poundage of methomyl used in 1980 was applied between March and September. This abundance of use, in addition to the high temperatures occurring between these months may contribute to the incidence of illness. Discomfort

experienced due to the heat is usually aggravated when protective clothing is worn. For that reason, protective clothing is not always worn. Again according to the Department's Annual Pesticide Use Reports (1976-1980), the major applications of methomyl are made on alfalfa and lettuce. Both crops are grown year-round in various counties of the State. As indicated on Table 5, the majority of the illnesses have occurred in Fresno, Kern, Tulare, Imperial and San Diego counties. These counties are among the leading areas for alfalfa and lettuce production.

CONCLUSION

It is evident from evaluation of the case studies, that failure to use required safety equipment is a major contributory factor in methomyl illnesses. In 60 percent of all incidents evaluated, employees either did not wear all of the required safety equipment or did not report if safety equipment was worn. In other incidents, contact with spray drift resulted in illness and in at least one of these, prompt decontamination after the incident may have reduced the ill effects. Inattention to safe work practices indicates inadequate training and supervision and/or employee negligence. Closer attention to safety procedures and proper use of safety equipment at both management and employee levels should further reduce the incidence of illness. Since the reformulation of methomyl into a wettable powder in soluble bags and a liquid, the number of illnesses due to methomyl exposure has declined dramatically. This would indicate that although methomyl is a toxic material, the hazards associated with its use have been reduced. Review courses in the safe handling of pesticides would be beneficial to the well-being of all workers. Occupational illnesses of this type appear to be a function of lack of knowledge and failure to obey rules and regulations. Therefore, workers should continually be educated on pesticide safety and encouraged to practice what they learn.

TABLE 1

Occupational Illnesses and Injuries Due to Exposure to Methomyl as Reported by Type of Illness and Amount Used from 1976 through 1980[1/]

Type of Illness	1980	1979	1978	1977	1976
Systemic Illnesses	21	21	32	46	25
Eye Injuries	3	3	4	9	2
Skin Injuries	1	1	2	1	6
TOTAL	25	25	38	56	33
Amount used (lbs.)[2/]	1,669,222	1,223,496	955,028	2,278,952	812,509

[1/] 1979, 1978, 1977 and 1976 values included for comparative purposes.
[2/] Usage reported according to the California Department of Food and Agriculture's Annual Pesticide Use Reports.

TABLE 2

Occupational Illnesses and Injuries Due to Exposure to Methomyl as Reported by Job Category and Type of Illness from 1976 through 1980[17]

	1980	1979	1978	1977	1976	TOTAL
Systemic Illnesses	21	21	32	46	25	145
Job Category						
Ground Applicator	7	5	6	6	4	28
Aerial Applicator	0	0	1	1	1	3
Applicator, Other	1	0	0	0	0	1
Mixer/Loader (unknown application)	0	0	2	0	1	3
Mixer/Loader (ground application)	0	1	0	2	1	4
Mixer/Loader (aerial application)	6	11	12	12	11	52
Nursery/Greenhouse, applicator or mixer/loader	2	0	2	2	0	6
Field Worker Exposed to Pesticide Residue	0	0	1	1	0	2
Drift	0	0	3	4	1	8
Tractor Driver/Irrigator	1	0	0	1	0	2
Cleaner/Repairer	1	0	0	1	1	3
Warehouse/Transportation Worker	1	0	1	2	0	4
Fireman	0	0	0	7	1	8
Flagger	0	0	1	3	1	5
Manufacturing/Formulation Worker	0	1	0	1	3	5
Other Type Pesticide Exposure	1	1	0	3	0	5
Self-Employed Applicator	1	2	3	0	0	6
Eye Injuries	3	3	4	9	2	21
Job Category						
Ground Applicator	2	0	0	6	1	9
Mixer/Loader (unknown application)	0	1	0	0	0	1
Mixer/Loader (ground application)	0	1	0	2	0	3
Mixer/Loader (aerial application)	1	0	2	0	1	4

TABLE 2 (cont.)

	1980	1979	1978	1977	1976	TOTAL
Eye Injuries (cont.)						
Job Category						
Nursery/Greenhouse, applicator or mixer/ loader	0	0	1	0	0	1
Drift	0	0	1	0	0	1
Packer/Processor	0	0	0	1	0	1
Other Type Pesticide Exposure	0	1	0	0	0	1
Skin Injuries	1	1	2	1	6	11
Job Category						
Ground Applicator	0	0	0	0	2	2
Mixer/Loader (ground application)	0	0	1	0	1	2
Mixer/Loader (aerial application)	1	0	0	0	0	1
Field Worker Exposed to Pesticide Residue	0	0	0	1	3	4
Tractor Driver/Irrigator	0	0	1	0	0	1
Flagger	0	1	0	0	0	1
Total Illnesses and Injuries	25	25	38	56	33	177

1/ 1979, 1978, 1977 and 1976 values included for comparative purposes.

TABLE 3

Occupational Illnesses and Injuries Due to Exposure to Methomyl as Reported by Disability Status and Hospitalization from 1976 through 1980[1/]

Estimated Days of Disability	1980	1979	1978	1977	1976
0	7	7	7	0	0
1-2	9	1	1	9	2
3-7	3	3	4	2	5
8-14	1	3	1	3	0
15-28	0	0	1	0	1
42	0	1	0	0	1
unknown	5	10	24	42	24
Total Estimated Days of Disability	39	88	56	64	96

Estimated Days of Hospitalization	1980	1979	1978	1977	1976
0	15	21	35	50	30
1-2	8	2	2	5	3
3-7	2	2	1	1	0
unknown	0	0	0	0	0
Total Estimated Days of Hospitalization	15	11	7	15	5

[1/] 1979, 1978, 1977 and 1976 values included for comparative purposes.

TABLE 4

Occupational Illnesses and Injuries Due to Exposure to Methomyl as Reported by Month of Occurrence from 1976 through 1980[1/]

Month	1980	1979	1978	1977	1976
January	1	0	0	0	1
February	0	0	0	0	1
March	1	0	1	4	1
April	0	2	0	0	2
May	1	2	7	1	2
June	2	1	2	4	0
July	3	6	9	6	9
August	6	8	15	19	5
September	9	2	3	10	7
October	2	4	1	11	3
November	0	0	0	1	2
TOTAL	25	25	38	56	33

[1/] 1979, 1978, 1977 and 1976 values included for comparative purposes.

TABLE 5

Occupational Illnesses and Injuries Due to Exposure to Methomyl as Reported by County of Occurrence from 1976 through 1980[1/]

County	1980	1979	1978	1977	1976
Butte	0	0	1	0	0
Colusa	0	1	0	0	1
Fresno	3	10	9	11	7
Imperial	2	2	0	4	11
Kern	2	2	4	4	3
Kings	1	0	0	0	0
Los Angeles	0	0	0	8	1
Madera	1	1	0	1	1
Merced	0	2	1	1	3
Monterey	1	1	0	3	2
Orange	0	0	1	0	0
Riverside	1	0	2	9	2
San Benito	0	1	0	0	0
San Bernardino	1	0	1	0	0
San Diego	4	0	4	5	0
San Joaquin	0	2	0	2	0
San Mateo	1	0	0	0	0
Santa Barbara	0	0	1	2	0
Santa Clara	0	0	2	1	0
Solano	0	0	0	1	0
Sutter	2	0	1	1	1
Tulare	5	2	6	0	1
Ventura	0	0	2	0	0
Yolo	1	1	3	3	0
TOTAL	25	25	38	56	33

[1/] 1979, 1978, 1977 and 1976 values included for comparative purposes.

TABLE 6

Occupational Illnesses and Injuries Due to Exposure to Methomyl as Reported by Job Category and Product Name and Formulation in 1980

Job Category	Formulation			
	Lannate SP	Lannate L	Nudrin 90	Unspecified
Ground Applicator	7	0	0	2
Aerial Applicator	1	0	0	0
Mixer/Loader (aerial application)	7	1	0	0
Nursery/Greenhouse, applicator or mixer/loader	2	0	0	0
Tractor Driver/Irrigator	1	0	0	0
Cleaner/Repairer	1	0	0	0
Warehouse/Transportation Worker	0	0	0	1
Other Type Pesticide Exposure	1	0	0	0
Self-Employed Applicator	0	0	1	0
TOTAL	20	1	1	3